On the teach

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[Reprinted from the Special Number of THE PHILADELPHIA MEDICAL JOURNAL on Medical Education, September 1, 1900.]

ON THE TEACHING OF PATHOLOGY.

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THE first thought of all will be, as it was my first thought, when, unguardedly, I acceded to the editorial invitation to contribute to these pages under the above title, that, if any one, a teacher should be able to write about the teaching of his special subject. Yet, unless the teacher is satisfied merely to set forth his particular methods the matter is far from simple. Those particular methods depend in every case upon environment, opportunity, and the man. In the case of pathology they depend upon the general curriculum of the school —whether by tradition the subject is made a part of the second, third or fourth year's course or is spread over two or more years; upon the number of hours allotted; upon the extent to which the special pathology of different systems and conditions is taken up in the courses in medicine and surgery; upon the nature and extent of the course in bacteriology. In fact, just as every school differs in the details of its curriculum, so must the course in pathology vary in its details in order that it may dovetail into the rest of the teaching with the maximum of benefit to the student and the minimum of loss by repetition. Not that repetition is not in itself of high value; next to wandering from one university center to another and gaining a broad and discriminating understanding of a subject by observing how it is regarded by those in different surroundings, comes the advantage of hearing and seeing how the different teachers in one center regard the same subject or portion of a subject common to all of them; but with the four years' course, and the terrible difficulty, nay, the impossibility of compressing everything into it, repetition has to be reduced to the smallest limits.

And as for the man, the fuller the acquaintance with

the methods of the great masters in any subject, the stronger the conviction that successful teaching depends not upon the fulfilment of any one code of procedure, but upon the peculiar gifts of the teacher. In pathology, for example, one man may be but an indifferent didactic lecturer, may, through his lectures give to his students but a poor and lifeless insight into his subject, yet in the laboratory he may be an enthusiast, and his keen interest in the disclosures afforded by the microscope or in the details and results of experimental investigation may be infectious and may fully accomplish the great aim, that, namely, of imbuing the student with an appreciation, nay a love, for the subject taught. Another may reach the same goal by his enthusiasm in the postmortem room, his deep knowledge of gross anatomical disturbances, his power of fixing in the mind vivid pictures of the results of different morbid processes. To yet another may belong the gift of clear, forcible exposition and of stimulating thought, so that the student carries away from the lectures not so much a wealth of facts as a knowledge of underlying principles and an added power of orderly reasoning over the problems which will confront him in the practice of his profession. To different men different talents, and if among these there be, for the teacher, the first great talent, that of communicating the sacred fire of enthusiasm, it matters but little what methods be employed. After all, what the university professor can accomplish is to instil only the beginning of knowledge into the student; this instilled, and a right interest aroused, it is for the student to increase that knowledge and he, with interest properly aroused, will surely "arrive."

Herein, very possibly, I speak as a heretic. In common with the majority of those having an English university training, the study of pedagogics has not formed part of my education; it is but right that in venturing to discuss "teaching" I should openly announce this fact, that my words be received with due caution. Nevertheless, if I may venture to criticise pedagogical methods, I would urge that those methods in the main are calculated for the nonenthusiastic and for the development of substitution products. They are methods whereby those cold and incapable of communi-

cating the fire are enabled to excite the attention of the student. It is true that employing them the interested teacher may become more interesting. But first and foremost must stand ardent and evident love for one's subject, and this—like the broader love, charity—covereth a multitude of sins.

I dwell upon this matter of diverse talents because at the present moment there is a movement, initiated at Harvard, to make the teaching of pathology almost entirely practical—and it is not unlikely that this movement may develop into a fashion, and fashions, I need scarce say, are apt to be extreme, applied without thought of propriety. If I understand aright, the orderly course of didactic lectures is practically abandoned; short talks are given daily upon the main subjects of, or arising out of, the demonstrations and experiments. But it is impossible to cover the whole ground of pathology by experimental work; certain important divisions do not lend themselves to classwork in the laboratory and, even if they did, it is here in very truth a case of "ars longa"; time imperatively forbids that the whole, of general pathology alone, be covered in this manner. As a consequence the student gains a peculiar insight into certain portions of the subject and none into others, completes his course and goes out into the world with an imperfect perspective or "Uebersicht." He has specialized too soon, and is liable to be one-sided.

This is the main objection to the method. Yet it is supported (*pace* Professor Bowditch) by a long array of pedagogical arguments, and in the case of individual teachers of strong personality it may be eminently successful in arousing a keen appreciation for pathology. I will go further and say that, where good teachers are wanting, the method is calculated, by the inherent interest of the subject, to make the student appreciate and gain benefit from pathology; for by it he is brought into the inner chamber. To "see the wheels go round" in itself attracts and fascinates the beginner; to study the works themselves and find out why they go round is of the highest value. Not for a moment do I question the value of laboratory methods; I do but question whether the reaction in favor of practical teaching may

not be carried too far, and whether, generally adopted, the Harvard method will be as fraught with good results elsewhere as it may very possibly be at the place of origin.

Everything depends upon the teacher in the first place, upon his opportunities in the second; and this being the case, I shall not venture to set out any ideal course. The most that can usefully be done is to discuss the place of pathology in the scheme of medical education, and, taking the different portions of the ordinary course in our subject, to consider certain aspects of the teaching of the same.

Pathology is the science dealing with the modifications undergone by the functions of the body in disease, with the causes, the course, and the results of those modifications. In order to understand deviation of function with the associated alteration in structure, it is essential to have a knowledge of normal function and normal structure; hence, the teaching of physiology and of anatomy (with histology) must precede the teaching of pathology. And here, if for a moment, I may digress into rank heresy, may I, as a pathologist, protest against the attitude of many physiologists of the present generation—an attitude which is damaging their influence in medicine. I refer to their tendency to teach their subject *per se*, regarding their science alone and regardless of the fact that their course to medical students is an integral portion—or should be—of one great whole. It is quite right that in instructing would-be physiologists this attitude be taken, and that research also, apart from teaching, be determined by the purest scientific considerations; but where in lecture and in the laboratory they have the choice of dwelling upon several branches of their subject, of equal value from an educational point of view, then dealing with medical students, they assuredly should give especial attention to such as are of especial value to those students, as forming a basis for their later studies.[1] The laws governing muscular

[1] I do not for a moment wish to suggest that the course in physiology should be in "medical physiology" alone. The student should be given a broad grasp of the whole subject. The ideal curriculum for the medical student, as Sir Michael Foster points out to me, is an elementary course in which the outlines of every department of physiology are treated, followed by an advanced course in which those portions which have a peculiar bearing upon medical problems of present interest are studied in fuller detail.

irritability undoubtedly throw great light upon the irritability of cells in general, and nerve-muscle experiments in the laboratory, performed by the students themselves, are of peculiar value as an introduction to the methods of exact investigation of bodily processes; but surely it shows a lack of sense of the fitness of things to devote one-third or so of the whole course in elementary physiology for medical students to the study of muscle-phenomena alone. As a consequence, the time of the pathologist is too often taken up in teaching elementary physiology. This ought not to be.

But while complaining thus, let me urge that the physiological laboratory is peculiarly the training-ground of the pathologist. Every physiological experiment is at the same time an experiment in pathology. Each time that the physiologist varies one or other factor concerned in a vital process, in order to determine the part played by it, he introduces a deviation from the normal; the experiment is physiological or pathological solely according to the point of view of the investigator. It is in the physiological laboratory that the student should learn the methods of pathological investigation.

Thus much with regard to the relationship of the subject to the first part of the curriculum. Now as to its relationship to the latter portion.

In order to understand the significance of the symptoms of an individual case of disease and the connection between them, it is essential to have a ground-work of knowledge of how those symptoms are in general produced, what disturbances they indicate in the structure and functions of one or other organ, and how those disturbances are likely to affect the system in general. It follows that the teaching of pathology should either precede that in medicine and surgery [more exactly, in medical and surgical diagnosis and prognosis]; or, as this is commonly not possible, that the main teaching in pathology be given coincidently with the first year's teaching in medicine and surgery, the instruction in the latter subjects being at the same time made largely pathological—that is to say, bearing not only on the symptoms of disease in themselves, but also, and particularly, upon their significance. From every point of view the latter is the better course. The student who

has studied, it may be, a mere half a dozen cases of disease, realizes thereby the practical bearing of pathology; there is the same difference between the alternatives as between learning a foreign tongue at home and learning it among the people who speak it.

In his teaching, the duty of the pathologist connected with a school of medicine is emphatically to keep ever before him the idea that his course is part of the curriculum, and—though this is not a popular statement—that he is the connecting link between the physiologist and the anatomist on the one hand and the physician and surgeon on the other. His duty is so to instruct those under him that they gain a basal knowledge of the deviations from the normal, of the principles of disease, a general knowledge which can be applied for the understanding of individual cases in the wards and in practice.

Keeping this in mind we obtain a standpoint for determining the nature of the instruction to be given in the different courses forming the curriculum in pathology.

Didactic Lectures.—If the textbooks of pathology most popular in English-speaking countries are in any way to be taken as an index of the general didactic teaching of our subject, then such teaching would seem erroneous in principle. Pathology does not stand towards medicine and surgery in the Hudibrastic relationship of rhetoric to oratory and composition. It is not primarily, as those textbooks would appear to indicate, the science of naming one's tools. Science to be complete science does not consist in the mere accumulation of details, in the grouping of facts and the naming of the same. This much is true, that in the evolution of every science there are three stages which may overlap but are still recognizable: The first, that of vague generalizations from inadequate data, terminating in the generalizations being tested and found wanting; the second, reactive, of recognition of the urgent need for the accumulation of masses of facts, the stage, if I may so express it, of appreciation of facts as facts; and the third, the stage of full development, when with abundant data before them the workers in the science may proceed so to group those data that general laws can be recognized and theories confirmed or disproved.

Under the dominant influence of Germany, owing to the inherent love of the German student for exact detail *quā* detail, but over and above all, owing to the, in most respects, wisely conservative influence of Virchow and his school, pathology has for long years been restrained in the second stage, which many still regard as the complete science. Our textbooks, which are either translations from the German or of necessity reflect German teaching, dwell far more upon facts than upon their relationship and significance. Lectures along these lines are largely useless, save as a means of introducing the student to the whole array of morbid phenomena, and to this is owing the small influence exerted by pathology upon the medical student in the days of pure didactic teaching. But lectures can be of inestimable use if the hours be employed in applying the facts, in discussing their causation and relationship and deducing the laws governing the development of morbid phenomena, thus incidentally training the student in the methods of medical thought. If by this means the student is helped to think (and he has too little stimulus to develop the faculty during his medical course) it is comparatively a matter of small moment if some one or other conclusion or theory of the lecturer fails to stand later criticism. It is along these lines that the didactic lecture must be laid down if it is to aid the student in the study of cases of disease. If from conscientious objections, or a natural unwillingness to venture upon conclusions, the teacher cannot thus teach, those lectures are better deleted from the calendar.

Lectures or Conferences upon the Special Pathology of the Different Systems.—These should follow the course in "general" pathology, preferably during the next year; their extent depending upon the extent to which the pathology of the different systems is treated by the lecturers in medical subjects; and, I may add, as regards certain portions of surgical pathology, by the surgeons. Where, as is most often the case nowadays, special pathology forms an important portion of medical teaching, the teaching of this branch in the pathological department best takes the form of a series of weekly conferences over museum specimens, the different systems being reviewed in succession, oral examinations

being held upon the gross anatomical conditions characterizing the various departures from the normal, the teacher from time to time stopping to dilate upon special topics and to systematize the facts brought forward. I do not say that this is at all adequate treatment; it is in many cases the most practicable. The true special pathology is the application of the laws of general pathology to special cases and its converse, the study of how the special case conforms to the general laws. And from the point of view of medical education the advantage would be great were this method of regarding special pathology to govern the later teaching of our subject more than it does at present—the physician and the surgeon (as is now the case) employing the former mode of dealing with the subject, the pathologist the latter, the student thus being instructed to gain a fuller appreciation of values by regarding phenomena from two aspects.[2]

Surgical Pathology.—Surgical pathology, by-the-by, is an *olla podrida* of select portions of general and systemic pathology, which should be treated didactically and practically in their proper places in the pathological curriculum. It only deserves to be recognized as a distinct entity when the needs of the surgical teachers demand that these select portions be treated at an earlier period than is possible in the orderly scheme of instruction. As a course it is possibly of service as a means of giving prominence to those matters in which the views of the surgeon run counter to the generally accepted teaching of medical science or the teaching of the individual pathologist—but such divergences, after all, can equally well be noted in the general courses in surgery and pathology. Happily, with the advance of surgery—and of the surgeon—into every organ of the body, surgical pathology promises soon to be concurrent with and to fuse with pathology proper. But much can be said in favor of the establishment of a special course of surgical clinical microscopy, in immediate connec-

[2] An admirable method of teaching "special" pathology has, I learn from Dr. Polk, been initiated at the Cornell Medical School. Arrangements are made whereby each special course in ophthalmology, laryngology, neurology, etc., is made complete in itself, by the physiologist giving a short course on the physiology, the pathologist upon the pathology, the specialist upon the medicine and surgery of the subject. In this way the fullest results are obtained with the least repetition and overlapping, or neglect.

tion with the wards and operating theater, for the determination of pathogenetic microbes and instruction in the rapid preparation and diagnosis of sections of removed tissues.

Laboratory Courses.—The value of laboratory training is so great that much might be said upon this topic alone, but at the same time it is nowadays so fully appreciated that my remarks need be few. As I have already stated, I doubt whether with the time at our disposal we are justified in giving the ordinary student a training in experimental research; that training he should have already received in the physiological laboratory, and, having received it, it is sufficient to presuppose a knowledge of modes of investigation and to deal in the main with the practical results of disease. An occasional demonstration bearing upon the mode of development of some particular morbid condition is, however, useful. The main course must be, and must remain, that in morbid histology. For this to be truly serviceable to the student, even if it be materially aided by the projecting of sections or microphotographs upon the screen, there must be an abundant supply of demonstrators—one to every ten students—to advise, instruct, and superintend the notebooks and drawings of the same.

I can but refer, in passing, to two other practical courses, that in clinical microscopy at the hospital or hospitals, in immediate connection with the ward cases, and that in pathological chemistry. The former, while conducted in connection with the medical department, should equally be under the supervision of the pathological; it is so valuable a portion of the practical teaching. To give practical advice concerning the latter is difficult, owing to the lack in English-speaking countries of those devoting themselves to this branch of the subject. But, certainly, the chemist who is not a medical man, and what is more, a trained "biologist," is not the right man to undertake the teaching of this subject, or, otherwise, it cannot in general be recommended that such teaching be conducted in the chemical department. Pathological chemistry gives so much promise of throwing, in the very near future, so much light upon pathology in general, that the time has come for greater activity in the teaching of this branch in immediate connection with the pathological department.

Postmortem-Room Teaching.—This is capable of being made a far more vital portion of the course in pathology than it usually is. The mere instruction in methods is after all of very secondary importance, and it cannot be said that the weekly demonstration of material from autopsies, crushed, discolored, and removed from its relationships, is particularly satisfactory. But if the students, in batches, be made to attend the actual performance, and take an active part in the same, the case is very different—and more, if, after the method pursued by my colleague, Wyatt Johnston, such students be given each an organ, be made to describe its appearance, to make or study sections from the same, to study the descriptions given by standard authorities kept for this particular purpose in the adjoining laboratory, and noting the descriptions to write a diagnosis stating how far the appearances correspond to or depart from the described state, then the postmortem-room becomes the first of all laboratories, the instruction there received the most valuable, whether from the point of view of pure pathology, or of the development of the good physician.

There are many details which might with advantage be taken up and discussed—among these, especially, the relationship of the bacteriologic and pathologic courses. Personally I am strongly of opinion that in a medical school the teaching of bacteriology should be under the direct control of the pathological department, for there is no study which at the present time throws more light upon the causation and development of disease, none so powerfully contributing to the advance of pathologic science. The relative stagnation of those schools of pathology from which, in Germany, bacteriology has been divorced, is in itself an object-lesson. I cannot, however, enter into the pros and cons of the matter. Space forbids. It will, I trust, he held sufficient if here upon the broadest lines I have outlined the individual opinions of an individual teacher upon the teaching of his subject.